

Technology Integration Preparedness and its Influence on Teacher-Efficacy

La préparation à l'intégration de l'informatique et son influence sur l'efficacité d'un enseignant

Coleen Moore-Hayes, Cape Breton University

Abstract

Recent inquiry has identified the establishment of positive self-efficacy beliefs as an important component in the overall process of successfully preparing new teachers for the classroom. Similarly, in-service teachers who reported high levels of efficacy for teaching, confirmed feeling confident in their ability to design and implement enriching instructional experiences. This article presents findings from a quantitative, descriptive study regarding teacher-efficacy related to technology integration. Utilizing a six-point Likert-type survey with an open-ended question, the research instrument was administered to a sample of approximately 350 preservice and in-service teachers within the Province of Nova Scotia, with a response rate of 48%. Analysis of quantitative research findings illustrated no statistically significant difference between preservice and in-service teachers' self-efficacy beliefs regarding their preparedness to integrate technology into their teaching. However, both segments of the sample reported specific instances from practice that caused them to experience feelings of low self-efficacy related to technology integration.

Key Words

Teacher-efficacy; technology integration; preservice teacher preparation, in-service teachers.

Résumé

Une étude récente a identifié l'acquisition de convictions positives en son efficacité personnelle au nombre des éléments importants du processus d'ensemble qui permet d'assurer le succès de la préparation des pédagogues à l'enseignement en classe. De même, des enseignants titulaires faisant état de hauts niveaux d'efficacité en enseignement ont confirmé qu'ils avaient confiance en leur propre capacité à concevoir et à mettre en place des usages pédagogiques enrichissants. Ce document présente les résultats d'une étude quantitative descriptive de l'efficacité des

enseignants relativement à l'intégration de l'informatique. On a fait passer cet outil de recherche, fondé sur un sondage en six points suivant l'échelle de Likert et sur une question ouverte, à un échantillon de quelque 350 enseignants titularisés ou en voie de titularisation de la Nouvelle-Écosse. Le taux de réponse a été de 48 %. L'analyse quantitative des résultats n'a pas fait ressortir de différence statistique importante dans les convictions entre enseignants titularisés et enseignants en voie de titularisation relativement à leur préparation à l'intégration de l'informatique dans leur enseignement. Toutefois, les deux segments de l'échantillon ont fait état de cas pratiques particuliers qui ont provoqué chez eux des sentiments de manque de confiance en soi relativement à l'intégration de l'informatique.

Introduction

Educators today experience unprecedented challenges in the classroom that have the potential to profoundly impact perceptions of personal and professional success. Inclusion, a progressively more diverse student population and the rapid growth of technology in education have added to the already demanding workload confronting teachers in the 21st century (Cennamo, Ross, & Ertmer, 2010; Lupart, 1998; Romi & Leyser, 2006; Thompson, 2005). In this changing environment, the process of simply delivering the required information to all students has put huge demands on teachers' increasingly limited instructional time: "Teachers have no means by which to prioritize what understandings and performances to emphasize in terms of 21st-century citizenship; workplace capabilities for the global, knowledge-based economy; and lifelong learning" (Dede, 2007, in press, in Clarke-Midura & Dede, 2010, p. 312). Recent inquiry identified a link between self-efficacy and teachers' perceptions of their ability to provide meaningful educational experiences for all learners as well as their willingness to engage in and experiment with new and innovative instructional strategies (Girod & Girod, 2006).

Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) defined teacher-efficacy as "teachers' beliefs about their own capacities as teachers" (p. 202) noting that the predominant influence on teachers' self-efficacy beliefs occurs during the preservice teacher training experience and the early teaching years. The Nova Scotia Department of Education (2005) also acknowledged that prospective teachers must be "well-prepared during their teacher training to have more than just the specific background needed to teach ... they need to be prepared for the many challenges of the modern classroom" (p. 3). Among practicing teachers, a significant factor in assuring success in the classroom and sustainability in the profession is a teacher's personal perception of preparedness. Schrum, Shelly and Miller (2008) advise that it is incumbent upon universities and school districts to ensure that preservice and in-service teachers are adequately prepared to teach with technology (p. 1).

Prominent among the issues that present the greatest challenges to teachers in the 21st century is integrating technology into teaching (Cennamo, Ross, & Ertmer, 2010; Clausen, 2007; Roblyer & Doering, 2010; Wang, Ertmer, & Newby, 2004). However, research on technology integration in the field of education remains mixed, with some studies purporting significant benefits to teaching and learning while others suggest it has no impact what-so-ever. This article presents findings from a quantitative, descriptive research investigation on technology integration and teachers' self-efficacy beliefs. A previous study (Moore-Hayes, 2008) investigated teacher-efficacy for four specific factors, which were determined to present challenges to today's

educators: technology integration, classroom management, inclusion and the teaching practicum. The research discussed in this paper will focus specifically on technology integration and its impact on teacher-efficacy.

The purpose of the current study was to obtain and measure preservice and in-service teachers' self-efficacy beliefs related to integrating technology into their teaching and to investigate any differences in perceptions of self-efficacy between the two groups. The study also sought to uncover specific examples from practice that impacted teachers' self-efficacy regarding technology integration, for both groups represented in the study.

Wang, Ertmer and Newby (2004) correlate low self-efficacy toward technology integration to a lack of self-confidence in a teacher's ability and willingness to use computers in teaching. Taking into consideration the immediate and long term impact of positive teacher-efficacy, findings from this investigation will be of interest to preservice and in-service teachers, teacher certification and licensing boards, and those responsible for the training and monitoring of new teachers.

Background to the Study

The rapid growth of technology in education continues to have a profound effect on the teaching profession. The changing nature of how we receive and distribute information suggests that educators need new strategies and tools for teaching and learning. Solomon and Schrum (2007) recommend that teachers should "work from (their) own strength which is pedagogy and to harness the technology and use it to help students learn thinking and analytical skills" (p. 22). This paradigm has redefined "good teaching," which, according to Strudler (2010) "should include the use of appropriate learning technologies as meaningful pedagogical tools" (p. 226).

In an effort to meet provincial and national standards for certification, many teacher training programs now include courses and hands-on experience in the use of technology for instruction, assessment and professional productivity (Lever-Duffy & McDonald, 2011). In-service teachers are also under pressure to demonstrate competency in educational technology literacy. Given the emphasis on technology skills as a critical determinant for measuring teacher success, schools throughout Canada and the United States are making a substantial investment in technology as well as teacher professional development for technology integration (Lever-Duffy & McDonald, 2010; Nova Scotia Department of Education, 2005). Yet despite greater access and training opportunities, educational technology remains underutilized in many classrooms. According to Roblyer and Doering (2010) "even teachers who have sufficient training and access to resources are not using technology as much as had been expected" (p. 13).

As the demand for innovative web-based strategies and assistive technologies increases, so too does the need to provide support for those charged with delivering instruction. Strudler (2010) cautions that although the field of technology and education is going through dramatic changes, support for dealing with those changes has not kept pace. Teachers find themselves faced with the pedagogical implications associated with moving to a new teaching and learning paradigm for which they may not feel fully prepared.

Current research indicates that a teacher's perception of his or her knowledge of educational technology along with the capacity to integrate technology into teaching has a direct impact on

self-efficacy beliefs (Levin & Wadmany, 2006; Pierson & McLachlan, 2004; Wang, Ertmer, & Newby, 2004). Rosenberg (2001) reported that when new users become mired in the technical aspects of technology, the learning process becomes “disappointing at best” (p. xv). New teachers often struggle with technology integration during their “transition from teacher education into the first years of teaching” (Clausen 2007, p.246). To alleviate the fear and uncertainty associated with teaching with technology there is growing support for providing practical skills for technology integration as part of the preparation of new teachers. Wang, Ertmer, & Newby (2004) contended that such “vicarious learning experiences have been shown to enhance student teachers’ self-efficacy for using computers in teaching” (p. 232). When coupled with the support and encouragement of a knowledgeable teacher-mentor, specific skills training along with practical experience has been determined to be a useful model for preparing new teachers to deal more effectively with the myriad of challenges associated with integrating technology into teaching.

For in-service teachers, the most critical obstacles to successful technology integration are most often personal barriers. Despite the increased availability of both educational technology and professional development opportunities, many teachers are still hesitant to integrate technology into the curriculum. This is especially true for teachers who do not feel confident in their personal technological skills or those who are reluctant to ask for assistance for fear of being thought incompetent. According to Pajares (2002), teacher-efficacy is not linked to ones’ capabilities, but rather “how capable one believes oneself to be” (para. 34).

As educational institutions move toward technology integration and computer-mediated course delivery, it is essential that teachers become proficient in the use of technology not only as a teaching/learning tool but also the related pedagogical implications. Even among today’s technology oriented teachers, change occurs so rapidly that it is difficult to keep pace (Cennamo, Ross, & Ertmer, 2010; Roblyer & Doering, 2010). The introduction of specific web-based strategies such as web-quests along with the prominence of social networking, wikis and other web-based collaborative tools has broadened the scope of technology literacy making it increasingly important for teacher to expand their knowledge base and technology skill set. “As school systems struggle with how best to deal with this cultural and technological shift, it is highly likely that the technology will continue to progress towards more powerful GPS-enabled, location-aware, WIFI handheld computers” (Dunleavy, Dede, & Mitchell, 2007, p. 7). The probability of continued growth and development of technology in education further illustrates the importance of ensuring that teachers develop strong self-efficacy beliefs in their ability to successfully integrate technology into their practice.

Conceptual Framework

The roots of teachers’ self-efficacy can be found in social learning theory (SLT), the premise of which is based on a philosophy that links positive feelings and behaviors in teachers to positive student outcomes (Bandura, 1977, 1986, 1993). Bandura (1993) reported, “teachers’ beliefs in their personal efficacy to motivate and promote learning, affects the types of learning environments they create and the level of academic progress their students achieve” (p. 117). Accordingly, instilling such principles in novice teachers could have long-term benefits throughout their teaching career, for themselves, for the students they teach and ultimately, for the education system (Bandura, 1993; Pajares, 2000).

In recent years, advances in educational technology coupled with the requirements associated with teaching an increasingly diverse student population have caused educators to consider different theoretical perspectives for integrating technology into the teaching and learning process. The emergence of an information-aged society has given way to divergent theories for improving educational practices. Current research suggests that teachers in the 21st century must be able to draw from a variety of instructional approaches and “select technology resources and integration methods that are best suited to their specific needs” (Roblyer & Doering, 2010, p. 43).

Research Questions

The focus of the discussion presented in this paper is preservice and in-service teachers’ self-efficacy beliefs related to integrating technology into their teaching. The study also investigated any differences in perceptions of self-efficacy between the two groups. In addressing this query, the research sought to gather and report specific examples from practice that impacted teachers’ self-efficacy regarding technology integration, for both groups represented in the study.

Methodology

A quantitative, descriptive research model was used to conduct an investigation regarding teacher-efficacy beliefs. A six point Likert-type survey with an open-ended question was administered to a sample of approximately 350 preservice and experienced teachers. The principle goals of the study were to examine teachers’ perceptions of their capacity to integrate technology into their teaching and also to uncover any significant differences that technology integration had on self-efficacy beliefs for preservice teachers as opposed to teachers who had prior classroom experience. As a secondary focus, the study also sought to collect specific examples from practice that influenced the establishment of teacher-efficacy beliefs.

Population Identification

The research sample was comprised of two discrete segments. The first segment consisted of preservice teachers who had completed their supervised teaching practicum at a Nova Scotia University. The preservice candidates were selected from teacher preparation programs at three separate universities in Nova Scotia, Canada (n=140). The second segment was comprised of Nova Scotia licensed teachers. Although candidates from this group had received their teacher training at a Nova Scotia university, findings indicated that some of the teachers were currently teaching in schools outside of the province (n=200). The response rate to the teacher-efficacy survey was 48%. Of the 164 respondents, 41% represented the group of preservice teachers and 59% were experienced teachers. In terms of gender, the distribution was 54% female and 46% male. Fifty percent of the respondents taught or were completing their supervised practicum in the elementary school system and 50% were teaching or practice teaching at the intermediate/secondary level. Sixty-seven percent of the in-service teachers had been teaching for more than two years.

The sample represented in the study had a unique characteristic. In Canada, departments of education fall under the jurisdiction of individual provinces and territories. As such, policies and standards governing the certification of new teachers differ from province to province. Ultimately, all teachers in the current study were required to meet the minimum outcomes

delineated by the approved program of professional studies as outlined in the Nova Scotia teacher certification approved program of professional studies (2011).

For the sample segment comprised of preservice teachers, practicum supervisors from the participating Nova Scotia universities invited eligible candidates to participate in the study. In-service teachers were contacted by the Teacher Certification Division of the Nova Scotia Department of Education and were invited to participate in the study. All potential participants were provided with a link to a website where the research survey and informed consent form were housed. Those choosing to participate completed the online teacher-efficacy survey anonymously.

Variables Influencing Teacher-Efficacy for the Sample

In comparing self-efficacy beliefs for technology integration for preservice and in-service teachers, various factors that could potentially influence the results of the study were considered. Most notable was the variance in the amount of teaching experience between the two segments. Although recently trained with the most current approaches to empowering teaching with technology, preservice teachers in the study lacked authentic classroom experience. This dichotomy could have skewed preservice teachers' personal perceptions of preparedness. For example, the self-confidence they experienced while still enrolled in the Bachelor of Education program, most likely, would not have authentically tested the utility of a prospective teacher's knowledge beyond the supervised practicum. Self-efficacy levels could be subject to change once the new teacher started his or her career. Similarly, novice teachers, according to Clausen (2007) "begin their careers with a host of developmental and contextual issues that create potential challenges and may affect whether they (continue to) use technology with their students" (p. 246). Encountering other challenges inherently faced by new teachers could also result in a change in personal perceptions of self-efficacy for technology integration.

By comparison, in-service teachers, especially those who have been teaching for several years, may be challenged with an expectation to adapt to the changes brought about by the rapid growth of technology in education, learning technologies and instructional technology. According to Schrum, Shelly and Miller (2008), many experienced teacher claim to have learned to use technology on their own and, as such, have no established standard by which to measure proficiency. Even in instances where schools do provide professional development for technology integration, such programs are often tied to budgets: "When support and funding disappears, so does change in practice for technology programs" (Schrum, Shelly & Miller, 2008, p. 3). Ultimately, increased expectations and inconsistency in training opportunities could influence self-efficacy perceptions for experienced teachers. Factors such as educational trends and priorities, school contexts, diversity, issues associated with availability of and access to technology as well as the legal and ethical issues that shape current technology use could also impact efficacy perceptions for technology integration.

In conducting the current investigation, it was not assumed that years of classroom experience or other previously noted factors would enhance or reduce teachers' self-efficacy beliefs for technology integration. Based on the assertion that self-efficacy is a more important determinant of teachers initiating and sustaining their efforts to integrate technology than is knowledge (Ertmer & Ottenbreit-Leftwich in Strudler, 2010), the focus of the current study was to conduct an investigation of a specific group of preservice and in-service teachers' self-efficacy levels for

technology integration. In Hall's (1987) model for effective teacher technology change, the author does not differentiate based on teaching experience. Hall attributes the most disappointing outcomes with technology to "under appreciating the challenges of implementation" (p. 251).

Research Instrument

Utilizing questions and a rating scale adapted from Tschannen-Moran and Woolfolk Hoy's (2001) research on teacher-efficacy, participants were asked to rank their perceived teacher-efficacy beliefs related to technology integration on a six-point, forced-choice response Likert scale. For the purpose of the current investigation, the research instrument was modified, with permission, to better address the goals of the study. The instrument also included an open-ended question that asked participating teachers to identify specific examples from their practice that they felt impacted personal perceptions of preparedness related to integrating technology into their teaching. Respondents were also invited to include any additional comments. The preliminary study (Moore-Hayes, 2008) asked teachers to respond to the open-ended questions in relation to four specific factors, which were determined to present challenges to today's educators. However, for the purpose of this research, discussion focused solely on responses related to technology integration and its impact on teacher-efficacy.

The survey was field-tested with four content experts prior to administering it to participants. Responses and reactions to the field test provided valuable information that was used to clarify and improve the instrument. The revised research survey, which included five questions related to each of the four identified topics, was administered to a sample of 340 teachers, with a response rate of 48%.

Analysis Method

The current study investigated teachers' sense of efficacy for five specific questions related to technology integration as well as any differences in the responses given by preservice as opposed to in-service teachers. The primary research question was examined using descriptive statistics to calculate the mean, mode, median, frequencies and percentages. Responses to the five questions were converted to numerical data. Data were analyzed by adding the score for the five items on the survey that related technology integration for both preservice and in-service teachers. Independent *t* tests were used to analyze data regarding any significant difference in reported efficacy levels between the two independent segments. Answers from the open-ended question were analyzed for general tendencies and recurring themes and the findings were reported descriptively.

Results

The research study described in this article was conducted in order to investigate teachers' self-efficacy for technology integration for preservice and experienced teachers. Teacher-efficacy was measured utilizing a 6-point Likert scale where values for responses to the five questions related to technology integration ranged from 1 to 6. A response of 1 indicated the lowest level of perceived self-efficacy for a specific aspect of technology integration whereas teachers who selected 6 on the Likert scale believed themselves to be well prepared to integrate technology for that particular question. Responses to the five questions were converted to numerical data. Excel and SPSS were used for statistical management and analysis.

Perceptions of Teacher-Efficacy

The survey was comprised of five questions related to teachers' perceptions about their self-efficacy beliefs regarding integrating technology into their teaching. The following section includes numerical representation, based on a six-point, forced-choice Likert scale, for responses to individual questions.

Table 1: Survey questions for self-efficacy for technology integration

	Preservice Teachers	In-Service Teachers
How competent do you perceive yourself to select and use various media to support teaching and learning?	4.1	4.0
How well prepared are you to evaluate software to support teaching and learning?	3.6	3.3
To what extent can you integrate technology across the curriculum?	3.9	3.8
How capable are you of determining why, when, and how to use technology in education?	3.9	3.8
To what extent do you feel prepared to select and utilize assistive technologies?	3.8	3.5

Note. 1 indicates low self-efficacy and 6 indicates high self-efficacy.

Individual responses to the five discrete themes from both segments of the sample revealed perceived self-efficacy levels of *less than adequate* (as determined by a score of less than 4) for all but one area. For the question related to teachers' perceptions of their competence to select and use various media to support teaching and learning, individual scores for preservice and in-service teachers were 4.1 and 4.0 respectively. This suggests that both segments believed themselves to be at least adequately proficient in this aspect of technology integration according to the categories delineated by the Likert scale.

The research question also investigated differences in the overall response given by preservice teachers as opposed to in-service teachers. Data for the corollary research question were also analyzed by adding the score for the five items on the survey that related to each individual variable for both preservice and in-service teachers. Independent *t* tests were used to analyze data regarding any significant difference in overall efficacy levels between the two independent groups.

As indicated in Table 1, there was no statistically significant difference between the preservice and in-service teachers' self-efficacy perceptions when comparing the composite scores for technology integration. Although not statistically significant, the mean value for preservice teachers' overall perception of preparedness to integrate technology was slightly higher (.15) than it was for in-service teachers. When these data are described descriptively, both samples of the segment reported that they perceived themselves to be "*less than adequately prepared*" to effectively integration technology into their teaching.

Moore-Hayes (2008) investigated teachers' self-efficacy beliefs in four independent areas related to teaching (technology integration, classroom management, inclusion and the teaching practicum). It was interesting to note that when comparing the composite scores for the four topics investigated in the preliminary study, the mean values were lower for responses related to teacher-efficacy for technology integration than they were for any other category.

Table 2: Overall Perceptions of Self-Efficacy for Technology Integration

	Preservice Teachers	In-Service Teachers
Mean	3.88	3.73
Variance	0.99	1.22
Observations	66	96
Hypothesized Mean Difference	0	
Df	149	
t Stat	0.92	
p (T<=t) two-tail	0.35	
t Critical two-tail	1.97	

Note. t-Test: Two-Sample Assuming Unequal Variances

Analysis of the results from the five survey questions related to efficacy for technology integration produced the lowest mean scores ($M = 3.79$), with 40% of the respondents indicating that they felt *not at all* prepared in this area. In addition to reporting the lowest efficacy levels, the standard deviations were higher for the scores related to technology than they were for any other category in the initial teacher-efficacy survey. This variation in responses could possibly be attributed to the previously noted variables that may have influenced teacher-efficacy for the sample.

Table 3: Preservice and In-service Teachers' Perceptions of Self-Efficacy for Four Variables

	Inclusion	Classroom Management	Technology Integration	Practicum	Overall Preparedness to Teach
Means	4.30	4.91	3.79	4.37	4.34
Standard Deviations	0.61	0.65	1.06	0.80	0.56

Note. Adapted from Moore-Hayes, 2008.

The teacher-efficacy survey also included an open-ended question as well as a section where participating teachers were invited to add any additional information or questions they had about the survey. These data were analyzed and the findings are reported descriptively, in the following section.

Discussion

Research findings revealed the lowest levels of teacher-efficacy for both preservice and in-service teachers were related to the sample's ability to evaluate and select software to support teaching and learning. Low teacher-efficacy was also reported regarding the extent to which teachers felt prepared to select and utilize assistive technologies to support teaching and learning. The increasing number of children requiring different treatments in the classroom has had a profound impact on the nature of teaching. According to The Canadian Council of Ministers of Education approximately 15.5% of the Canadian school aged population is in need of some form of specialized help at school (Statistics Canada, 2004). As a result, 21st century teachers must be adequately prepared with the skills and confidence to assess and implement effective technology solutions for an increasingly diverse group of special needs and mainstream students. To ensure successful integration practices, teachers should also have access to relevant training and services as well as collaborating technical support. Current research emphasizes the emergent body of knowledge that is dedicated to specific strategies for selecting, adapting and integrating assistive technology across the curriculum (Cennamo, Ross, & Ertmer, 2010; Lever-Duffy & McDonald, 2010; Nova Scotia Government, 2005).

Similar concerns were expressed in the comments of teachers who participated in the teacher-efficacy study: "I would have felt more prepared to use technology in my French class if I had some actual hands-on experience during my practicum" (respondent #304). Another participant who had been teaching for a number of years commented "I was aware of a variety of assistive technologies that were deemed effective when teaching a child with autism but I did not feel confident enough to suggest any particular adaptation as part of the child's Individual Program Plan (IPP)" (respondent # 070). Vannatta and Fordham (2004), in their investigation of computer-efficacy, determined that feelings of anxiety such as those described in the current study can have a negative impact on teacher-efficacy levels for technology integration.

For the question related to knowing when, where and how to use technology, preservice and in-service teachers both indicated that they felt less than adequately prepared. Cennamo, Ross, and Ertmer (2010) contended that successful technology integration requires more than access to hardware and software claiming it is the teacher who is ultimately responsible for ensuring that "all students have equitable opportunities to use all of the technology resources available in an interactive classroom" (p. 284).

When analyzing responses to the question from the teacher-efficacy survey which asked participating teachers to identify specific examples from their practice that they felt impacted their perceptions of preparedness related to technology integration, the following themes emerged: a) prospective teachers identified the value of completing at least a portion of their practicum in a technologically-advanced classroom; b) teachers from both segments of the sample described the importance of being mentored by a teacher who was experienced in effective, on-line teaching strategies; and c) both groups also felt that their efficacy for technology integration would be enhanced if they had the opportunity to participate in an online course, as a student. Wang et al. (2004) affirmed that exposure to such best practice models helps to alleviate the fear and uncertainty associated with teaching with technology. Similarly, regular in-servicing and other professional development opportunities utilizing current approaches to empowering teaching with technology was recommended by participating teachers as an effective means of increasing efficacy levels for technology integration.

Limitations and Recommendations

As indicated, the current study did not include certain variables that could potentially influence self-efficacy perceptions for technology integration for preservice and experienced teachers. Additional questions related to school contexts, various educational trends and priorities, as well as legal and ethical issues that shape current technology might have resulted in more diversity in the responses between the two segments of the sample.

Another perspective that may further inform the body of knowledge on self-efficacy for technology implementation is “level of use,” which Hall (1987) identifies as a key component of educational change. The current study did not investigate levels of implementation, which could potentially have a direct impact on teachers’ perceptions of their preparedness to effectively integrate technology into the curriculum and their teaching.

Recommendations

Woolfolk and Hoy’s (1990) sense of self-efficacy research established, that even at the preservice stage, there was evidence of a decline in teacher-efficacy between the classroom instruction and the first practice teaching experience. As that particular component was outside of the parameters for the current study, a recommendation for future research would be to replicate the investigation for the purpose of measuring efficacy levels for technology integration of preservice teachers during different phases of their teacher training experience.

The literature reviewed for this study established that an expectation exists for preservice and practicing teachers to demonstrate proficiency in both their knowledge base and ability to effectively utilize educational technologies within their practice (Nova Scotia Teachers Union & Nova Scotia Department of Education, 2001; Wang, Ertmer & Newby, 2004). It was further established that the greatest barriers to successful technology integration are personal barriers related to their efficacy-beliefs (Clausen, 2007; Schrum, Shelly & Miller, 2008). Responses from the teacher-efficacy study denoted that new teachers would have felt better prepared to include technology as part of a teaching strategy if they had been exposed to more authentic examples of successful technology integration during their teacher training. In-service teachers also expressed the need to observe and participate in best-practice models, which demonstrated technology in teaching as part of their professional development for technology integration. Therefore, a recommendation for the profession is to provide additional opportunities for preservice and in-service teachers to observe and practice exemplary examples of effective technology integration paradigms.

Conclusion

Woolfolk Hoy (2000) reported “the development of teacher self-efficacy beliefs among prospective teachers has generated a great deal of research interest because once self-efficacy beliefs are established, they appear to be somewhat resistant to change” (p. 5). The research described in this article investigated the impact of technology integration on teacher-efficacy for preservice and experienced teachers. The study also examined any differences between the efficacy levels for the two segments.

Findings established that overall teacher-efficacy for technology integration was less than adequate as determined by responses to the survey questions. Preservice teachers experienced

marginally higher self-efficacy for technology integration than did the sample of in-service teachers. Analysis of quantitative data from the investigation determined that there was no statistically significant difference between the two groups when comparing the composite scores for self-efficacy for technology integration. However, given the myriad of challenges that have the potential to profoundly impact teachers' perceptions of personal and professional success, both segments of the sample reported specific instances from their practice that caused them to experience feelings of low self-efficacy related to technology integration.

Despite an increase in the availability of and exposure to technology in education, teachers are still hesitant to move toward full integration. As enhanced teacher-efficacy is an essential prerequisite for effective technology integration, the specific examples from practice provided by teachers in the current study will contribute to the existing body of knowledge, thereby linking teachers' self-efficacy beliefs to their perceptions of preparedness for technology integration.

REFERENCES

Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning, *Educational Psychologist*, 28, 117-148.

Cennamo, K.S., Ross, J. D., & Ertmer, P. A. (2010). *Technology integration for meaningful classroom use: A standards-based approach*. Belmont, CA: Wadsworth Cengage Learning.

Clarke-Midura, J., & Dede, C. (2010). Assessment, Technology, and Change. *Journal of Research on Technology in Education*, 42(3), 309–328.

Clausen, J. M. (2007). Beginning teachers' technology use: First-year teachers development and the institutional context's affect on new teachers' instructional technology use with students. *Journal of Research on Technology in Education*, 39(3), 245-261.

Dunleavy, M., Dede, C., & Mitchell, R. (2007). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of Science and Educational Technology*, 18, 7-12.

Girod, M., & Girod, G. (2006). Exploring the efficacy of a Cook school district simulation. *Journal of Teacher Education*, 57(5), 481-497.

Hall, G. E., & Hord, S. M. (1987). *Change in schools: Facilitating the process*. New York: State University of New York Press.

Lever-Duffy, J., & McDonald, J. B. (2011). *Teaching and learning with technology 4th Edition*. Boston, MA: Pearson Education.

Levin, T., & Wadmany, R. (2006). Teachers' beliefs and practices in technology-based classrooms: A developmental view. *Journal of Research of Technology in Education*, 39(2), 157-181.

Lupart, J. (1998). Setting right the delusion of inclusion: Implications for Canadian schools. *Canadian Journal of Education*, 23(3), 251-261.

Moore-Hayes, C. (2008). *Teacher Efficacy: Exploring preservice and beginning teachers' perceptions of their preparedness to teach*. Unpublished doctoral dissertation, Capella University, Minnesota.

Nova Scotia Department of Education (2005). *Learning for life II: Brighter futures together*. Province of Nova Scotia.

Nova Scotia Government (2005). *Blueprint for building a better Nova Scotia: A 2005 progress report*. Government of Nova Scotia.

Nova Scotia Government (2011). *Nova Scotia teachers certification approved program of professional studies*. Retrieved from http://certification.ednet.ns.ca/approved_program.shtml

Pajares, M. F. (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from <http://www.emory.edu/EDUCATION/mfp/eff.html>

Pierson, M. E. & Cozart, A. (2004). Case studies of future teachers: Learning to teach with technology. *Journal of Computing in Teacher Education*, 21(2), 59-63. Retrieved from http://consilr.info.uaic.ro/uploads_lt4el/resources/pdfengCase%20Studies%20of%20FutureTeachers.%20Learning%20toTeach%20with%20Technology.pdf

Roblyer, M. D., & Doering, A. H. (2010). *Integrating educational technology into teaching* (5th ed.). Boston: Pearson Education Inc.

Romi, S., & Leyser, Y. (2006). Exploring inclusion preservice training needs: A study of variables associated with attitudes and self-efficacy beliefs. *European Journal of Special Needs Education*, 21(1), 85-105.

Rosenberg, M. J. (2001). *e-Learning: Strategies for delivering knowledge in the digital age*. United States: McGraw-Hill.

Schrum, L., Shelly, G., & Miller, R. (2008). Understanding tech-savvy teachers: Identifying their characteristics, motivation and challenges. *International Journal of Technology in Teaching and Learning*, 4(1), 1-20.

Soloman, G., & Schrum, L. (2007). *Web 2.0. New tools- new schools*. Washington, DC: International Society for Technology in Education.

Statistics Canada. (2004). *Canadian social trends: Profile of disability in 2001*. Retrieved from <http://www.statcan.gc.ca/pub/89-577-x/index-eng.htm>

Strudler, N. (2010). Perspectives on technology and education. *Journal of Research on Technology in Education*, 42(3), 221-229.

Thompson, S.A. (2005). Classroom behaviour management for diverse and inclusive schools. *Canadian Journal of Education*, 28(1/2), 203-209.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17, 783-805.

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher self-efficacy: Its meaning and measure. *Review of Educational Research*, 68(2), 202-248.

Vannatta, R.A., & Fordham, N. (2004). Teacher dispositions as predictors of classroom technology use. *Journal of Research on Technology in Education*, 36(3), 253-271.

Wang, L., Ertmer, P.A., & Newby, T.J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education*, 36(3), 231-250.

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of self-efficacy and beliefs about control. *Journal of Educational Psychology*, 82, 81-91.

Woolfolk Hoy, A. E. (2000, April). Changes in teacher self-efficacy during early years of teaching. Paper presented at the annual meeting of the American Educational Research Association. LA (April 28, 2000). Retrieved from <http://wps.ablongman.com/wps/media/objects/290/297451/changes%20in%20efficacy.pdf>

Author

Coleen Moore-Hayes, Cape Breton University. Email: Coleen_hayes@cbu.ca



This work is licensed under a Creative Commons Attribution 3.0 License.